CLAIMS

1. A method to form a silicon-on-insulator structure comprising:

compensation doping a buried insulator substrate, the buried insulator substrate comprising an insulator layer between a body layer and a highly-doped substrate layer doped to a first doping polarity, with dopants of a second polarity opposite the first polarity to form compensated regions in the highly-doped substrate layer adjacent the insulator layer.

2. The method of claim 1 wherein compensating doping forms compensated regions with dopant concentrations substantially equal in magnitude to the dopant concentration of the highly-doped region of the substrate layer.

3. The method of claim 2 wherein the magnitudes of dopant concentrations for the compensated regions and highly-doped region are about $1x10^{19}$ atoms per cubic centimeter.

4. The method of claim 1 wherein doping comprises implanting dopant ions into the compensated regions via ion implantation.

5. The method of claim 4 wherein the thin substrate layer comprises a channel region between a source region and a drain region, the source and drain regions being doped to the second polarity and the channel region being doped to the first polarity, and wherein the channel region is shielded from implanting dopant ions by a masking structure.

6. The method of of claim 5 wherein the channel region is shielded from implanting dopant ions by a gate.

7. The method of claim 1 further comprising doping to form a channel region between a source region and a drain region, the source and drain regions being doped to the second polarity and the channel region being doped to the first polarity.

8. The method of claim 7 wherein the second polarity is an N-type polarity and the first polarity is a P-type polarity, forming a NMOS structure.

9. The method of claim 7 wherein the second polarity is an P-type polarity and the first polarity is a N-type polarity, forming a PMOS structure.

10. The method of claim 7 wherein the thin substrate layer and highly-doped substrate layer comprise silicon, and wherein the insulator layer comprises silicon dioxide.

11. The method of claim 10 wherein the body layer and insulator layer both have a thickness of about 100 angstroms, the highly-doped region and channel region are doped to a first doping polarity at a concentration of about 1×10^{19} first dopant atoms per cubic centimeter, the source and drain regions are doped to a second doping polarity at a concentration of about 1×10^{21} second dopant atoms per cubic centimeter, and wherein compensation doping to form compensated regions comprises further doping the compensated regions with second dopant atoms to a concentration of about 1×10^{19} second dopant atoms per cubic centimeter.

12. The method of claim 11 wherein the first dopant atoms are boron atoms, and wherein the second dopant atoms are selected from the group consisting of arsenic and phosphorus atoms.

13. The method of claim 11 wherein the second dopant atoms are boron atoms, and wherein the first dopant atoms are selected from the group consisting of arsenic and phosphorus atoms.

14. A silicon-on-insulator structure comprising:

a body layer comprising source, drain, and channel regions, the channel region being positioned between the source and drain regions;

a highly-doped substrate layer, the highly-doped substrate layer being doped to a first doping polarity;

an insulator layer between the body layer and the highly-doped substrate layer;

wherein the highly-doped substrate layer comprises two compensated regions adjacent the insulator layer and aligned with the source and drain regions, and an uncompensated region between the two compensated regions aligned with the channel region, the compensated regions being further doped with dopants of a second polarity opposite the first polarity.

15. The silicon-on-insulator structure of claim 14 wherein the source and drain regions are doped to a second doping polarity.

16. The silicon-on-insulator structure of claim 15 wherein the channel region is doped to the first doping polarity.

17. The silicon-on-insulator structure of claim 14 wherein the compensated regions are doped with dopants of a second polarity to a concentration substantially equivalent to the concentration of the first doping polarity of the uncompensated region.

18. The silicon-on-insulator structure of claim 14 further comprising a masking structure to substantially shield the channel region from implantation of dopants of a second polarity into the compensated regions.

19. The silicon-on-insulator structure of claim 18 wherein the masking structure comprises a gate.

20. The silicon-on-insulator structure of claim 16 wherein the second polarity is an N-type polarity and the first polarity is a P-type polarity, forming a NMOS structure.

21. The silicon-on-insulator structure of claim 16 wherein the second polarity is an P-type polarity and the first polarity is a N-type polarity, forming a PMOS structure.

22. The silicon-on-insulator structure of claim 16 wherein the thin substrate layer and highly-doped substrate layer comprise silicon, and wherein the insulator layer comprises silicon dioxide.

23. The method of claim 22 wherein the body layer and insulator layer both have a thickness of about 100 angstroms, the uncompensated and channel region are

doped to a first doping polarity at a concentration of about 1×10^{19} first dopant atoms per cubic centimeter, the source and drain regions are doped to a second doping polarity at a concentration of about 1×10^{21} second dopant atoms per cubic centimeter, and wherein the compensated regions are doped to a second doping polarity at a concentration of about 1×10^{19} second dopant atoms per cubic centimeter.

24. The method of claim 23 wherein the first dopant atoms are boron atoms, and wherein the second dopant atoms are selected from the group consisting of arsenic and phosphorus atoms.

25. The method of claim 23 wherein the second dopant atoms are boron atoms, and wherein the first dopant atoms are selected from the group consisting of arsenic and phosphorus atoms.